THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF FISH AND GAME
MARINE RESOURCES REGION

REPORT FOR THE MONTH OF JANUARY 1974

On January 3 a fire completely destroyed Star Kist's Terminal Island processing plant #1. This block long, two story structure housed all their wetfish and pet food production facilities plus the maintenance shops. Around the clock clean-up and repair efforts succeeded in restoring, to limited capacity, two small reduction plants in one week.

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The Tomales Bay herring fishery opened January 4 and closed January 11, after reaching the 450 ton quota. The success of this limited-access fishery was due in no small way to the fine work of the marine wardens and the patrol boat BONITO in particular.

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An experimental plant of 213 yearling silver salmon was made in the Santa Margarita River, Camp Pendleton, as part of the Department's Marine Sport-fishing Improvement Project.

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A tagged crab at liberty a record 963 days was recovered off Point Reyes. This crab had migrated 39 miles from San Pablo Bay, molted twice and grew 51 mm.

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Crab Larvae Culture Meeting

On December 19 and 20, 1973, Arthur W. Haseltine, Assistant Marine Biologist, Marine Culture Laboratory, attended discussions and demonstrations of techniques of culturing crab larvae. The meetings at the Marine Science Center, Newport, Oregon were attended by specialists of the Oregon Fish Commission, Oregon State University, and California Department of Fish and Game.

The subject matter included program objectives, project techniques, and results of experiments conducted during recent years. Details of controls of laboratory environmental factors - light, temperature, aeration, and foreign particles were major considerations. For mass culture studies control of biological factors of larvae concentration, food per volume of container, various crustacean larvae as food, cannibalism, and parasitism were reviewed in reference to degrees of success in the laboratory. The effects of pesticides and antibiotics on crab larvae rearing were discussed.

The relative values of static and continuous flow seawater systems for larvae culture were compared and specific values for each clarified.

It was also noted that careful consideration of potentials of genetic strains of natural populations should be considered in the selection of brood stocks.

Direct application of some of the newly refined techniques of larvae and food concentrations, environmental controls, and selection of crabs from several populations for larvae production are being applied to the on-going special crab rearing studies at the MRR, Marine Culture Laboratory. Others will be tested as the project continues and late larval stages as well as juvenile crabs from this year's hatching appear in the bay and ocean waters.

1. WILDLIFE PROTECTION

A. Canneries: On January 3, a spectacular fire completely destroyed the Star-Kist Cannery (Plant #1) and severely damaged the two reduction plants. This block-long two story structure housed all of the wetfish production, maintenance shops, and much of the pet food production and storage of the company. By working around the clock, Star-Kist was able to put the smallest of the two reduction plants back in operation within a week. This plant will handle the offal from the tuna operations at Plant #4 and a limited amount of anchovies trucked in the back way from other unloading facilities.

First night out for anchovies, on the 6th, found only one cannery capable of reducing the fish; three boats landed 130 tons. The next two days the boats were unable to go out due to bad weather. On the 9th, a few boats were able to go out and the one operating cannery received over 275 tons. Bad weather again kept the boats from fishing the balance of the week. During the week of the 13th through the 18th, the fleet was able to fish on reduced limits and the transfer of fish between boats resulted in approximately 2800 tons of anchovies being landed for reduction. Star-Kist was able to take a token amount of anchovies during this period. The market price on meal dropped resulting in a $10 cut per ton for anchovies; $47.50 per ton. Fishermen refused to fish anchovies during the week of the 20th through the 25th. The price was settled at $52.50 per ton and was retroactive to the 21st.

Mackerel landings were poor due in part to bad weather and the lack of fish. On the night of the 23d several boats were able to find mackerel at Horseshoe Kelp and some 280 tons were landed and processed. The price rose from $100 per ton to $115 as of the 21st.

The tuna fleet sailed on the 15th to open the 1974 season. Prices for tuna were settled at $575 per ton for yellowfin and $545 per ton for skipjack. This is an all time high. Tuna processors have been busy packing imports and tuna they have held in storage from last year.

The price for bonito was set at $270 per ton on the 21st and $245 per ton for fish under 4 lbs when ordered.

B. Market Fish: Squid landings dominated the catch during January in the San Pedro area. Up to twelve squid boats would be unloading on any given day. Catch per boat ranged from 1 ton to 35 tons, depending on capacities and success.

Lobster landings have been down during January. Inclement weather and heavy seas have prevented the small boats from going out. Heavy seas also were responsible for damage to lobster traps.

Many of the local markets are depending on imported fish due to decreased local landings. Some rockfish are being landed, but until the weather clears and the seas calm, landings will remain small. Some jack mackerel was delivered in mid-January. A few sardines were mixed in the loads.

Drag boats did fairly well in northern waters during periods of calm seas. Most crab fishermen in the Eureka and Crescent City area have quit fishing, and those in the San Francisco area settled their strike and agreed to take 75¢ per pound for their catch. They resumed fishing on January 19.

C. Sportfish: Rockfish continued to be the major fish taken by sport fishermen, both on private boats and those run by sportfish landings that are still operating.

Low tides during the reporting period made many intertidal areas accessible for clam and abalone activity. Weather was the only factor to limit activity during these minus tides. Weather also limited diving activities along the coast.

D. Weather: Periods of high winds, rain, and in some areas, flooding of the coastal rivers, curtailed both sport and commercial activities during the early part of the month. Fair weather with some rough sea conditions limited activity during the remainder of January.

E. Law Enforcement: The herring fishery opened on January 4 in Tomales Bay and the 450 ton quota was reached on January 11 as 450.8 tons were actually taken by the five boats operating under permits issued by the Fish and Game Commission. This was the Department's first experience with a limited-access fishery and was generally well received by the industry. Additional patrol was needed to prevent the quota from being exceeded. Fine work by the Patrol Boat BONITO and other marine wardens limited the excess herring take to only .8 tons.

Weather limited most patrol functions; however, low tides required assistance for enforcement from other regions in some coastal areas.

Lobster related violations continued to be a major enforcement problem. Several arrests were made for violations of the commercial abalone and lobster regulations. Public assistance and undercover operations have produced several arrests in the San Diego area.

F. Pollution: During the reporting period there were 23 pollution incidents in the Los Angeles/Long Beach Harbor area, involving approximately 821 barrels of pollutants. All spills were contained and cleaned up except a 2100 gallon aviation fuel spill at LAX which was flushed into the storm drain system by the Los Angeles Fire Department. Industrial sources had twelve spills of 769 barrels; nine merchant vessels spilled a total of 52 barrels of pollutants; one Navy and one unknown source combined for a total of 10 gallons of spilled pollutants.

A garbage dumping problem in Mendocino County was investigated and resolved. Two vessels collided off the Monterey County coast, resulting in some beach oil pollution. All other coastline counties suffered numerous minor pollution problems during the recent heavy rains; most of the pollution was attributable to runoff of accumulated surface street and industrial pollutants.

2. BOTTOMFISH

A. Fishery

Flatfish: Stormy seas limited the trawl effort for most of the state during January. When there was a break in the weather, good catches of petrale sole were made. Fishing occurred between 150 fathoms and 250 fathoms on the winter spawning grounds. Dover sole landings at all ports were light due to weather limiting accessibility. Other flatfish taken in relatively small amounts include sand sole, sanddabs and English sole.

Roundfish: Morro Bay and Monterey boats landed the bulk of the rockfish trawled off California during the month. The dominant species in the central California catch were bocaccio and chili-pepper. Eureka had light landings of black rockfish while San Francisco had a moderate amount of brown rockfish and some darkblotched rockfish. Sablefish and channel rockfish landings were down for the month due to the limited fishing in deeper water.

B. Research

Flatfish: Flatfish landings were sampled at major ports for age, sex, and size composition.

Editing of trawler logs and receipts for December was accomplished. Age determinations were completed for all Dover sole tag returns collected to date. The paper on the validity of using otoliths to age petrale sole is in the typing process.

Roundfish: Rockfish landings were sampled at major ports for species composition and size.

Analysis of the data from 1972-73 gill net cruises continued.

3. SHELLFISH

A. Fishery

Crab: Landings through December totaled approximately 254,000 pounds in the San Francisco area. There were very few landings during the first half of January due to a price dispute. The price was lowered from $1.00 per pound to 80¢ per pound on January 13 where it remains.

In northern California price negotiations between dealers and fishermen delayed crab fishing this month. Settlement was finally reached on January 17 and a price of 75¢ per pound to the fisherman was agreed to. Rough seas have hampered opening efforts and the few catches landed at the dock have been poor.

Shrimp: Season closed.

Oysters: Coast Oyster Company resumed harvesting January 3, after having been shut down due to polluted bay conditions resulting from a major break in the Arcata City sewer line. The market is normal.

Clams: A series of good low tides at the beginning of the month brought out large numbers of razor clam diggers at Clam Beach. Clam diggers interviewed during two tides averaged 12.2 clams with a mean size of 111 mm. Virtually all of the clams were of the 1971 year class.

B. Research

Crab: Six tagged crabs were recovered this month off San Francisco. The most notable of which molted twice to grow 51 mm and traveled 39 miles from Red Rock Marina in lower San Pablo Bay to 1-1/2 miles S.W. of Point Reyes while at liberty a record 963 days.

Sea sampling was conducted in the Gulf of the Farallones aboard commercial crab vessels. During January the average catch was composed of 43% legal males, 15% sublegal males, and 42% females. The females are just now starting to enter the crab traps after the larvae have hatched from their sponges of eggs.

Ring netting and trawling for crabs in San Francisco and San Pablo Bays was conducted. Crabs were measured, sexed and condition noted. All of the crabs caught were of the 1973 year class.

Crab tagging was conducted at the Trinidad dock. Attempts were made to collect female crabs on Clam Beach during low tide for pesticide analysis.

Oysters: Mortality among experimental oyster populations was negligible.

Clams: A stratified random sampling plan was designed for determination of catch, effort, and size data from the Clam Beach razor clam fishery.

C. Miscellaneous

Considerable time was spent revising the manuscript of the Oyster Disease and Mortality Report which is to be submitted as an Administrative Report.

The research boat PANDALUS was hauled out for routine maintenance and painting of the bottom.

4. ABALONE

A new program to establish seasonal condition indicies of commercial size abalone was initiated this month. January length/weight frequencies were established for whole weight, foot weight, and gonad weight of red, pink, green and black abalones.

We assisted John Fitch during the juvenile Pismo clam survey at Atascadero Beach, Morro Bay. Several groups of razor clams were also dug and processed to determine length and weight of these clams which sea otters are now foraging on in this area.

A draft Sea Grant proposal was prepared for the continuance of our northern California red abalone studies with Humboldt State College.

Several inspections, including aerial and shoreline, were made of the oil spill from the Navy vessel U.S.S. MERRILL at Oceano, Pismo and Avila Beaches.

Marginal diving weather prevailed during our January KELP BASS cruise at Santa Rosa Island and each day's operations were limited to those few areas where a lee could be found from swell and wind. Twenty survey stations were occupied on traditional commercial red abalone fishing beds at Bechers Bay, Ford Point, Johnson's Lee and Talcott Shoal. Good concentrations of reds were found throughout the Johnsons Lee area, while red sea urchins were found to dominate many of the other areas restricting abalone distribution and abundance.

A sample of 300 red abalones, ranging in length from 23 to 241 mm, was collected at Johnson's Lee and transported alive to Long Beach. These were processed to determine length/weight frequencies by whole weight, foot weight and gonad weight, and to obtain notes on maturity, sex, and condition.

5. LOBSTER

Late log returns, added to our card deck, provide the following catch information:

October	94,102 pounds
November	43,371 pounds
Total	137,473 pounds

Historically, fifty percent of the season's catch occurs in October and November. Based on this, we can expect a season log catch of 275,000 pounds. So far, pink ticket receipts have been running 25 percent less which indicates a season pink ticket total of 200,000 pounds.

As the 1973-1974 season progresses, effort and catch/effort is steadily declining.

Dealer price to lobster fishermen began the season at $1.70 - $1.75/lb. This price was steady throughout October. In November some dealers paid up to $1.80 - $1.85/lb. In December a few sales went as high as $2.15/lb but many were still at the opening price of $1.70 - $1.75/lb. The price for bulls picked up from $1.55/lb to $1.60/lb between October and December.

Additional effort was expended this month marking lobsters for age and growth studies at Santa Catalina Island. The lobsters are marked with coded punches in the telson and uropods corresponding to 3 mm carapace length groupings. We now have 707 marked lobsters released in the study area. Recapture rates are running about 15 to 20%.

Assistance was given to Marine Patrol in recovering lobster tails discarded by two commercial fishermen into Fish Harbor. Two hundred and eighty tails were recovered.

6. MARICULTURE RESEARCH AND DEVELOPMENT (Bartlett Project M64R)

Dungeness crab fecundity studies continued during the month. Four ovigerous specimens, from the San Francisco area, released larvae. One specimen, that measured 169 mm shoulder width, released an estimated 1,089,000 larvae during an 11-day period.

Both continuous flow and static crab larvae culture systems have been started. Initially, to facilitate control and evaluation, all culture systems will remain small. As small systems prove successful, the techniques will be expanded to larger mass culture systems. The present static systems are based on techniques developed by Oregon Fish Commission personnel.

Temperature tolerance studies of adult red abalone were accomplished. Test animals were acclimated at 20°C and exposed to higher temperature elevations. This study is supported by Pacific Gas and Electric Company funds of contract for ecological study.

Juvenile red abalone from the November 30, 1973, spawning are doing well. Some specimens are nearly 1 mm long; however, the 1st respiratory pore is not yet evident.

Eighteen-year-old Pacific oysters and Marine Culture Laboratory spawned, F-1 generation Pacific oysters were shipped from Humboldt Bay to the laboratory for further evaluation of the "disease resistant" strain. Initial attempts to spawn these oysters in the laboratory were unsuccessful. Further attempts will be made after a short period of laboratory conditioning.

Work began on the installation of a new 4-inch PVC seawater line from our main storage reservoir to the new bioassay laboratory now under construction. Part of this seawater service will also be used to improve the water supply in our south laboratory.

Preliminary landscaping plans for the Marine Culture Laboratory site have been drafted with the aid of Department engineers.

7. SPECIAL STUDIES PROGRAM

Work on sea otter necropsies is continuing. Good progress is being made in working up the backlog of carcasses recovered prior to July 1, 1973.

Carcass recoveries have been much lower during the past few months than during the same period a year ago. During November-December 1972 and January 1973, 20 carcasses were recovered, 12 of which occurred in January. So far this winter, none were recovered in November, 4 were recovered in December, and only 4 had been recovered in January by the 23rd of the month.

Approximately 30 female crabs have been obtained from the San Francisco area with the cooperation of Shellfish personnel, for toxicity and relative fecundity studies currently under way. Collection of crabs in the Eureka area has been delayed by a fishermen's strike and inclement weather along the north coast.

However, on January 23, Shellfish personnel at Eureka were able to collect approximately 30 female crabs from Crescent City, since commercial crab fishing is under way in northern California. Comparative studies on crabs from both San Francisco and Eureka areas are in progress.

8. PELAGIC FISH

A. Fishery

Landings in tons	January		January 1 - January 31		
Species	1974*	1973	1974*	1973	10 yr. mean 1962-1972
Anchovy	5,386	94	5,386	94	5,838
Mackerel, jack	333	115	333	115	1,119
Mackerel, Pacific	-	-	-	-	124
Sardines	-	1	-	1	33
Squid	250	849	250	849	1,134
TOTAL	5,969	1,059	5,969	1,059	8,248

*Estimated. Accumulated landings are revised monthly.

B. Fishery Research Monitoring

Anchovy: Although fishing conditions were very good throughout the month, landings were limited by the canneries reduced ability to process fish. To begin with, water quality regulations currently in effect cut down the amount of fish which could be processed. Then on January 2, the main anchovy reduction facility at Terminal Island burned down; however, all was not lost since some machinery remained intact and limited reduction has resumed. The canneries can now process about 25% of their previous (last season) maximum capacity.

Jack Mackerel: San Pedro fishermen spent only 4 or 5 days fishing for mackerel. A few boats had good success at Horseshoe Kelp.

Squid: Plentiful concentrations of squid were found at Catalina and San Clemente Islands.

Herring: The Tomales Bay quota was filled on January 11, with 450.8 tons being landed. Of the 500 ton quota for San Francisco Bay, 191 tons have been landed.

Live Bait: During the early part of January both sportfishing and live bait fishing activities were greatly curtailed due to heavy rains and rough seas. However, when they were able to fish, anchovies were abundant and bait haulers easily met the limited demands of the sportfishing industry. A number of bait fishermen took advantage of this limited demand for bait to shut down operations long enough to perform yearly maintenance on their boats and equipment. Towards the end of the month anchovies were again available in Los Angeles Harbor after an absence of many weeks.

C. Biological Studies

Mackerel Tagging Program: Tagging operations were curtailed during January due to poor availability of fish. There were 3 tagged jack mackerel and 10 tagged Pacific mackerel recovered near their release site and all had been at liberty less than 120 days.

Genetic studies on the jack mackerel population are continuing and preparations are being made for an extended sampling cruise in March.

Squid: Data from daily market landings is being gathered and analyzed for aging and population studies.

Herring: Two measureable spawnings have occurred in Tomales Bay so far this season. The December 26-27 spawning run consisted of approximately 500 tons of herring while the January 19-20 spawning run was 3 to 4 times greater. A spawning run of approximately 500 tons occurred in San Francisco Bay December 16 through 19.

D. Fisheries Resources Sea Survey (M63R)

Publication of sea survey data collected during 1973 was delayed due to machine errors at the computer center where the report was compiled. By month's end good computer runs were produced from which quality printouts will be used for lithographing. The report should go to the printer within a week.

A light weight enclosure made of PVC tubing and 1/2 inch monofilament was constructed for the upcoming acoustic experimental cruise. The enclosure is cylinder shaped with a volume of 6 m^3. It will be placed under the ALASKA's 38 KHZ echo sounder with various numbers of anchovies. Acoustic echo levels of various school densities will be measured for comparison with those recorded from wild schools. This information should greatly enhance our capabilities of determining anchovy school biomass from acoustic records.

All electronic equipment with our acoustic gear was calibrated and tested for insuring correct and accurate measurements.

Sea Survey Data Analysis: Sardine effort analysis, Pacific mackerel historical data and analysis, and jack mackerel otolith reading continued this month. A manuscript describing jack mackerel age composition of the commercial catch for the 1947-48 through 1956-57 seasons was completed by month's end and resubmitted for possible publication as a Marine Resources Technical Report.

9. BIG GAME FISH

A. Albacore - Research

Population Dynamics: Editing the California logs was completed. By careful examination, many logs were rendered usable from those that were difficult to interpret or that lacked a radio call sign. Logs from Oregon were processed during the last half of the month. The job should be completed next month. Computer programs to be used to analyze the new logs have not been finished pending possible changes in the input format.

Fisheries - No action

B. Bluefin Tuna - Research

Life History: Age and growth--Final compilation of the age composition of the bluefin tuna catch from 1957-1969 was underway this month.

Fisheries - No action

C. Pacific Bonito - Research

Population Structure: Additional project personnel are being trained this month in the use of electrophoresis for population analysis. A total of 62 eye lenses was collected in January for this research.

Life History: Age and growth--Two weight-length-otolith samples were collected from bonito landed at the Terminal Island canneries. Check reading of all otoliths read for our age and growth paper is continuing. Final analysis of data for a paper is being completed.

Migration--In January, 16 tags were returned. Two of these were recovered from bonito which had been exported to Australia.

Resource Management: Fishing effort was 12 percent greater in December than in November, while the catch (3,580) was 8 percent greater in December than in November (3,320). The abundance index (0.19) for December indicates that anglers found bonito slightly more abundant than during November when the index was 0.15.

Fisheries

Sport: Fishing was poor this month except for reported catches in King Harbor and near the Westminster Bridge.

Commercial: Due to rough weather, only 30 tons of bonito were landed at the Terminal Island canneries this month. These fish averaged about 4 pounds and were caught offshore of San Onofre.

D. Billfishes - Fisheries

No action.

Education and Public Relations: The belief by some swordfish fishermen that the use of aircraft had wiped out the east coast swordfish fishery initiated a letter from this office to 70 swordfish fishermen. It contained an historical review of the east coast fishery. The letter was well received, and many fishermen have responded with letters.

Resource Management: Two bills limiting the swordfishery reportedly were introduced into the State legislature. One is to outlaw the use of aircraft and the other to provide for a permit system under the control of the Fish and Game Commission.

E. Barracuda - Research

Life History: Migration--One tagged barracuda was recovered during January. It was at liberty 229 days, and was caught approximately 3 miles from its release point.

Resource Management: Partyboat sampling--No barracuda were sampled during the month.

Although January figures are incomplete, fishing effort in December was 9 percent lower than during November. Preliminary figures also indicate that the landings for December declined 43 percent from November.

Fisheries

Sport: Very little action.

Commercial: No action.

F. White Seabass - Research

Resource Management: Partyboat sampling--No white seabass were measured on partyboats this month.

Figures for January are incomplete; however, the fishing effort in December was 70% lower than in November and anglers caught 94 percent fewer white seabass. In addition the abundance index of 0.002 indicates that anglers found white seabass less abundant than during November.

Market Sampling--White seabass landed at the fresh fish markets were sampled in January. The 34+ fish measured ranged 81 to 104 cm in length and V to IX years in age. Preliminary results indicate that age groups V and VI contributed more than 60% of the catch:

JANUARY

Age Group	% age composition
IV	-
V	24
VI	38
VII	18
VIII	15
IX	6
X	-

Fisheries

Sport: No activity

Commercial: One boat landed fish caught off Mexico.

G. California Yellowtail - Research

Resource Management: Partyboat sampling--Yellowtail caught by the partyboat anglers were sampled in January. The 21+ fish measured ranged 71 to 97 cm in length and III to VII years in age.

Preliminary results indicate that anglers set their hooks in 4 age groups of yellowtail this month, with group VI providing about 62% of the catch. By comparison, this age group contributed just over 8% in December and about 13% in November.

Figures for January are incomplete; however, the fishing effort in December was 41% lower than in November and anglers caught 92% fewer yellowtail. In addition the abundance index of 0.002 indicates that partyboat anglers found yellowtail less abundant than during November:

	JANUARY	DECEMBER (173)		
Age group	% age composition	% age composition	Estimated catch (nos)	Abundance index
0	-	-		
I	-	2	9	0.002
II	-	16	70	0.012
III	5	22	96	0.016
IV	-	10	44	0.008
V	14	40	175	0.030
VI	62	8	35	0.006
VII	19	1	4	0.001
VIII	-	-		

Market sampling--Yellowtail landed at the fresh fish markets were sampled in January. The 6 fish measured ranged 85 to 90 cm in length and V to VI years in age:

JANUARY

Age group	% age composition
IV	-
V	33
VI	67
VII	-

Fisheries

Sport: The only activity was on long range partyboats.

Commercial: One landing was made of fish caught off Mexico.

10. SPORTFISH IMPROVEMENT PROJECT

Two hundred and thirteen yearling silver salmon, from Darrah Springs hatchery, surviving a 5-day live car test in the Santa Margarita River, Camp Pendleton, were released into the stream. Seven fish died during the test, six within the first hour, one on the following day. Temperatures ranged from 52° to 56°F, salinities from 0 to 3°/oo. Upwards of 5,000 juvenile striped bass will be planted in southern California marine waters from the M/V N. B. SCOFIELD in February. If the initial plant works as expected, an additional 15,000 stripers will be planted at various locations in the immediate future.

Catch Assessment: Catch sampling of marine sportfishermen continued in January, although weather and other factors slowed fishing. An expected run of surfperch did not materialize in Orange County, due possibly to water colder than normal.

General: An ozalid copy of the San Diego-Orange Counties fishing map was given staff approval, pending the publication date around mid-February. Arrangements were completed to tag all spotted sand bass taken by the Long Beach Casting Club members and guests on their annual Bass Tag Day, scheduled February 2.

11. SPORTFISH

A. Partyboat

The preliminary report of key species of partyboat catch and effort through December 1973 compares with 1972 as follows:

THROUGH DECEMBER	1973	1972	Preliminary Catch December 1973 only
Rockfish	3,557,624	3,039,155	195,471
Bonito	471,110	416,587	3,580
Kelp & sand bass	655,779	773,118	2,284
Pacific mackerel	198,821	244,348	797
Yellowtail	217,954	56,016	437
Striped bass	20,204	31,685	347
California halibut	9,572	8,081	160
Barracuda	91,547	37,953	104
Sturgeon	634	971	81
Halfmoon	168,218	159,500	20
Salmon	124,559	151,533	(closed season-2

Total catch	5,869,432	5,437,925	211,898
Total anglers	873,428	789,513	24,324

B. Central California Marine Sportfish Survey

Work is progressing on the new project objectives. Equipment was ordered and arrangements were made for placing a permanent mooring at Stillwater Cove.

One day was spent at Sacramento correcting figures for Bulletin 158.

The skindiving report 1972 was returned from the MRR Editor and is being retyped for final printing.

Project personnel attended a meeting with Parks and Recreation on kelp harvesting at Monterey on January 10.

Miller presented sportfishing information on the Point Pinos area to the Central California Regional Water Quality Control Board on January 11.

Houk and Hardwick dove at Cannery Row on January 14 to obtain kelp greenling samples.

Miller met with Dr. Nybakken, Moss Landing Marine Laboratories regarding sea otter predation on Pismo clams off Moss Landing on January 16.

Houk dove with Hardwick in Tomales Bay for the herring project, obtaining quadrat data on eel grass density on January 16 and 17.

Houk presented information on sportfishing and marine resources in general to 40 members of a biology class at Aptos High School on January 18 and 22.

12. ENVIRONMENTAL SERVICES

A. Water Quality Activities

Waste Discharge Requirements: Seven proposals submitted for review were found adequate.

Regional and State Board Activities: Data collected during the December Arcata Bay sewage spill was submitted to the North Coast Regional Water Quality Control Board for use at a public hearing.

Comments were provided to the State Board staff regarding zooplankton studies relative to the operation of San Onofre Units 2 and 3.

Testimony was presented at a State Board public hearing on Areas of Special Biological Significance. Further evidence recommending inclusion of San Clemente Island, and the Newport Beach-Irvine Coast Marine Life Refuges as ASBS was provided.

The State Board hearing in Los Angeles regarding a proposed Water Quality Plan for Bays and Estuaries of California was attended to respond to any further questions regarding earlier testimony.

Material generated during an informal review of the San Diego Basin Plan was provided for the use of the Basin Planner.

Pollution Control Activities: Investigation of an apparent release of heavily silt laden water from an AVCO Corporation holding pond on Salt Creek was undertaken. Data will be submitted to the Regional Water Quality Control Board.

Ocean Dumping Permits: A proposed EPA permit for the dumping of wet garbage and dry trash at two sites (9 miles east of Catalina and 35 miles SW of San Clemente) was reviewed and found adequate.

B. Water Development Activities

General Project Reviews: Four documents were received during the month. The Long Beach Queensway Development and General Environmental Siting Guidelines for Nuclear Power Plants prepared by the AEC were both found to be adequate. Documents forwarded by local sponsors for Campbell Industries and National Steel and Shipbuilding Company, both of San Diego, were found to require additional information to produce adequate impact statements.

Army Corps of Engineers: Two permit application (L.A. District) were reviewed. No comments were offered.

Reviews of the Corps operation and maintenance proposal for Morro Bay Harbor was completed and found adequate. Negative reports regarding Bolinas Beach, Channel and Lagoon were concurred with.

A meeting with the Corps of Engineers, San Diego County representatives, Bureau of Sport Fisheries and Wildlife and Region 5, DF&G was attended to discuss potential mitigation measures for the Sweetwater River Flood Control proposal.

Coastal Zone Commission: In depth, review comments were compiled and sent to the North Coast, South Coast and San Diego Regional Coastal Zone Conservation Commissions for their respective Marine Environment element of the Coastal Zone Plan.

Miscellaneous: Comments regarding a review of a draft Morro Bay Wetland Report were submitted to the Chief of Operations.

The foundation of the Granite Canyon Bioassay Laboratory was installed by the contractor. Plans for landscaping the grounds of the Mariculture-Bioassay Laboratory facilities were submitted to the Central Coast Regional Coastal Zone Conservation Commission for their approval.

13. INSHORE FISHERIES HABITAT EVALUATION AND MONITORING

Draft manuscripts of the Marine Environment Element for the South Coast Regional Coastal Zone Conservation Commission and the San Diego Coast Regional Commission were reviewed for Environmental Services.

Background information on abalone and lobster resources in southern California were gathered for the joint AFS-Wildlife Society meeting to be held February 1-2, 1974 in Monterey.

Project personnel participated in a five day lobster cruise to Catalina Island and a seven day abalone/lobster cruise to Santa Rosa Island aboard the R/V KELP BASS.

ENVIRONMENTAL AND BEHAVIORAL STUDIES OF COASTAL SPORTFISHES

John Duffy was elected chairman of the Department's Diving Safety Board for this year.

Project personnel spent one day fishing for sheephead and sculpin (for tagging purposes) in the area of Horseshoe Kelp. Duffy and Odenweller made a dive near the Los Angeles-Ventura County line to assist Marine Patrol in searching for illegal lobster traps. Duffy also assisted Marine Patrol on a night dive in Los Angeles Harbor to retrieve a bucket containing more than 280 "short" lobster tails. One day was spent helping the Kelp Project search for kelp paddies in the San Pedro Channel in order to collect the fishes associated with the drifting kelp masses for life history studies.

Work continued on the preparation of the CONES Report and preliminary work for a life history study of barred sand bass (*Paralabrax nebulifer*) was instituted. Odenweller talked to Dr. E. D. Lane's class (field methods course) at CSULA and Duffy spoke on artificial reefs at a luncheon of the Exchange Club of Long Beach.

14. KELP PROJECT

Heavy storms occurring in the first ten days of January 1974 removed much of the dense surface canopy in the study area and relocated several of the more buoyant chains into shallow water where transplants sustained considerable wave damage.

The Kelp Project obtained, without cost, seven shots, 630 feet of anchor chain, through the Federal government excess property disposal service. This heavy chain, worth about $500 per shot, will be used to anchor transplants in Abalone Cove. It should be heavy enough to anchor hundreds of rapidly growing buoyant kelp plants in the heaviest seas without drifting.

Preparations for another kelp transplant are currently underway. Nine shots, 810 feet, of heavy and medium weight chain with lines attached were placed in Abalone Cove over rocky substrate in 25 to 35 feet of water. These chains will be used to anchor transplants brought in during February's operations.

Final draft of a Marine Resources leaflet pertaining to giant kelp *Macrocystis*, is being prepared. This leaflet explains in lay-terms the importance of giant kelp in the nearshore environment, its effect on enhancement of fish and invertebrate populations, life history of kelp, present status of the kelp resource and kelp restoration efforts.

15. DIABLO CANYON ECOLOGICAL SURVEY (P.G.&E. Contract S1902)

Two trips to the Diablo intertidal were made during the minus tide series of January 4-10 and January 18-22. A total of 10 intertidal stations were surveyed for invertebrates and algae. Concurrent abalone surveys were made along one meter to either side of our 30 m transect line in most stations and one station yielded a high count of 397 abalone ($6.62/m^2$): 386 black abalone and 11 red abalone.

Two reports were finished during the month: a quarterly report for the October 1 - December 31 period at Diablo Canyon and our final report for the Mendocino site which was sent to the MRR editor.

16. MARINE FISHERIES STATISTICS

A. Source Documents

The following source documents were edited: December cannery and marine sport catch logs; August market and trawlers.

Editing is in progress on the following source documents: September market and trawlers; January marine sport catch logs.

The December marine sport catch letter was prepared and mailed. Delinquent partyboat lists were prepared and distributed to enforcement personnel and delinquent letters sent to boat operators. The December striped bass list was provided to Anadramous Fish Investigations.

A special letter was prepared and sent to skin diving partyboats requesting species breakdowns on abalone catches.

B. Machine Data Processing

Regular reports tabulated were: November cannery, jack mackerel, anchovy reduction, and lobster logs; July 1973 statistical report; December marine sport catch series, cannery, processor, jack mackerel, anchovy reduction and lobster logs and August trawlers. Annual sampling decks for 1973 were prepared on shrimp logs, anchovies, Neomysis shrimp, and sport salmon. In addition, reports were run for 1970 bluefin tuna logs, Hunter Survey Program, and annual tuna letter.

Special jobs completed were five years of training records on Jack Witever for the training officer.

C. Licenses and Registrations

Master list changes were sent to Sacramento and the field offices. The January list of unregistered boats making deliveries was prepared and distributed to enforcement personnel. A week was spent in checking reports for NMFS on California boat registration numbers and document numbers.

After thirteen years of outstanding, meritorious and dedicated service, Ethel Lavitt will be retiring at the end of January.

D. Information

Routine and special reports were decoded and distributed. The December tuna letter was prepared and mailed. Assistance to source document editing continued.

E. Fishery Surveillance

Fourteen dealer contacts were accomplished to resolve landing receipt discrepancies. A week was spent assisting the abalone survey at Santa Rosa Island. A review and analysis of sea urchin logs vis a vis landing receipts was completed. Log reportings were generally lower than market ticket landings by around 27%. From this information a projected estimate of 1.8 million pounds was made for 1973 sea urchin landings. A formal report was prepared and submitted.

F. NMFS Commercial Fisheries Survey

Returns from the questionnaire survey were heavy in early January. To date over 1100 returns have been received, which is a little over 45% of the delivered questionnaires. Keypunching has been completed except for a few returns still coming in at a rate of a couple a day.

17. VESSELS

ALASKA and N.B. SCOFIELD: Both vessels were in the yard for overhaul the entire month.

KELP BASS: The vessel conducted the following cruises: a four day lobster study at Catalina Island, a seven day abalone study at Santa Rosa Island, and a three day kelp transplant study off Palos Verdes Peninsula.

18. MISCELLANEOUS

A. Meetings, Talks and Visitors

January 2 - Frey met with Dr. Tom Thompson, Moss Landing Marine Laboratory, to discuss squid studies.

January 4 - Gates, Carlisle, Mall met with Roland Harris of Scripps to discuss sand transport control experiments--Long Beach.

January 7 - Carlisle met with Ira Allan of Houston, Texas to discuss underwater filming of offshore oil towers--L.B.

January 7 - Gates, Fullerton, Frey, met with Starkist re California anchovy resource. Palos Verdes.

January 8 - Gates, Leiby and staff met with Kelco representatives re Monterey kelp cutting.

January 9 - Frey, Sunada, and Lehtonen met with members of the staff of the Instituto Nacional de Pesca laboratory at El Sauzal to discuss anchovy sampling methods and techniques.

January 10 - Orcutt, Gotshall, and Miller met with Parks and Recreation, Monterey to discuss Carmel Bay kelp problems.

January 10 - Young discussed marine sportfishing problems with 75 members of the Long Beach Casting Club.

January 15 - Frey met with Dr. Paul Mandel to discuss a proposed study on "The politics and economics of the California anchovy fishery."

January 15 - Phillips attended meeting of Southwest Regional Reclaimation Authority regarding wastewater treatment and disposal alternatives--San Juan Capistrano.

January 16 - Moore and Phillips attended County Sanitation District of Orange County workshop on alternative waste treatment methods--Fountain Valley

January 16 - Nelson attended the WQCB hearing on the City of Arcata sewer line break in December.

January 17 - Jow met with the Technical Advisory Board of the City of San Francisco and Brown and Caldwell Company to discuss progress of their ecological studies in the bay and in the ocean for data for use in sewer outfall developments.

January 18 - Phillips accompanied City of Huntington Beach personnel in routine water quality sampling of Bolsa Bay--Huntington Beach.

January 21 - Gates and Sportfish staff participated in initial phases of planting of silver salmon at Camp Pendleton.

January 22 - Dahlstrom and Collier attended the State/Federal Crab Advisors meeting at Santa Rosa

January 22 - Orcutt met with L. Fisk of Water Quality Management on environmental monitoring in central California.

January 22 - Gates and Frey met with J. L. Bumgardner, G. E. Johnson, and N. Felando concerning California anchovy resource.

January 23-24 Dahlstrom attended the State/Federal meeting on crab biology at Portland, Oregon.

January 29 - Orcutt and Dahlstrom met with ORB at Menlo Park on shrimp management.

Jan 28- Feb 2 - Gates attended meeting in Mexico City re tuna quotas.

B. Personnel

10/24/73 - Gayle Jones - Clk Typ 11 - Fisheries Resources Sea Survey - Long Beach - Separated

1/1/74 - Fred E. Wendell - Jr. Aquatic Biologist - Ecological Study, Mendocino-Monterey - Appointed.

1/1/74 - Wilbur H. Dull - Lieutenant - Marine Patrol - Long Beach Promoted from Game Warden

1/1/74 - Patricia Barnett - Clerk Typist II - Fisheries Resources Sea Survey - Long Beach - Appointed.

1/2/74 - Douglas L. Chessmore - Janitor - Administration - Long Beach - Appointed TAU.

1/2/74 - Thomas Bennett - Fish and Game Warden - Marine Patrol - Berkeley - Appointed.

1/2/74 - Ralph C. Wells - Fish and Game Warden - Marine Patrol - Long Beach - separated (deceased)

1/18/74 - William Elliott - Deckhand - Research Vessels - San Pedro Separated.

Doyle E. Gates
Regional Manager

MRR-LB/200
2-1-74/cc

Report for Month of JAN - 1974

A. ARREST REPORT

Number of persons arrested as compared to same periods last year:

219	232
Same Month Last Year	Current Month
219	232
Total Arrests Same Period Last Year	Total Arrests This Year

Remarks - To explain any marked changes in above totals _____

Fines paid.....	$ 6,873.00	$ 8,856.00
	Same Month Last Year	Current Month
Total fines to date.....	$ 6,873.00	$ 8,856.00
	Same Period Last Year	Same Period This Year

Remarks - To explain any marked changes in above totals _____

Jail days served.....	0
Jail days suspended.....	310
Cases Dismissed.....	6
Cases in which all of fine was suspended.....	23
Juvenile cases turned over to juvenile authorities or parents contacted.....	1
Hunting licenses revoked by court.....	
Hunting licenses suspended by court.....	
Sport fishing licenses revoked by court.....	
Sport fishing licenses suspended by court.....	

Summary: Following is the number of violations prosecuted against type of violation.

Hunting, no license.....		Angling, no license.....	65
Waterfowl.....		No inland stamp.....	
Deer.....	1	Trout.....	
Pheasant.....		Striped Bass.....	
Resident small game.....		Other inland fish.....	1
Doves and pigeons.....		Angling more than one rod.....	3
Mountain lion.....		Clams and shellfish.....	134
Bear.....		Commercial abalone.....	
Raptors.....		Commercial lobster.....	2
Loaded gun in car.....	3	Commercial fish.....	2
Baited pond shooting.....		Commercial fish records.....	2
Protected nongame birds, fully protected, rare or end. species		Ocean sportfish.....	9
		Pollution (5650) (Oil).....	4
Litter.....	3	" " (Other).....	1
Public shooting area trespass.		Stream obstruction (5948).....	
Trespass (2016-18).....	2	1601-1602.....	
Prohibited species.....		Miscellaneous.....	
		TOTAL	232

B. ASSISTANCE TO OTHER LAW ENFORCEMENT AGENCIES

1. Number of cases filed by Wildlife Protection officers for violation of Penal or other code sections..... 0
2. Number of cases filed by Wildlife Protection officers for city or county ordinances..... 0
3. Number of cases turned over to federal agencies for filing..... 0
4. Number of cases of assistance to other agencies resulting in filing of charges (not included in 1, 2, or 3 above)..... 0
5. Number of cases involving felony charges..... 0
6. Section 151 Harbors & Navigation Code _____ 0
   Total Fines Paid cases

C. DEER ACCIDENTALLY KILLED

1. Road kills by motor vehicles 0
2. Kills from other causes (railroads, canals, dogs, etc.) 0

D. HUNTER SAFETY REPORT

1. Hours spend on Hunter Safety Training..... 0
2. Hunter Safety classes attended..... 0
3. Hunter Safety instructors contacted..... 0
4. Hunter Safety instructor applicants interviewed..... 0
5. Hunter safety instructor training classes conducted..... 0
   a. Number of instructors attending..... 0
6. Public agencies (law enforcement agencies, recreational departments or districts, schools, etc.) contacted about Hunter Safety..... 0
7. Private organizations (service clubs, Boy Scouts, sportsmen clubs, etc.) contacted about Hunter Safety..... 0

*8. Expenses charged to Federal Aid W58H1 during report period... 0

*9. Mileage charged to Federal Aid W58H1 during report period.... 0

*Regional Hunter Safety Coordinator Federal Aid W58H1 Employees only.

10. Narrative report of highlights in Regional Hunter Safety activities. (Use space below or additional sheets):

MARINE RESOURCES REGION
ANNUAL ACHIEVEMENT REPORT - 1973

WILDLIFE PROTECTION

Marine wardens, in conjunction with the United States Coast Guard, continued to monitor the foreign fishing vessels operating off the California coast. Twenty-six flights were flown, resulting in the sighting of 41 foreign vessels all operating off California. All vessels observed were operating beyond the 12-mile contiguous fishing zone.

A large scale and well organized operation involving the taking of black abalone from the intertidal zone of the Santa Barbara Channel Islands, contrary to law, was investigated by marine wardens operating from Santa Barbara. An all night surveillance conducted on Santa Rosa Island disclosed eighteen men from six abalone boats taking black abalone illegally. Eleven arrests were made and a total of 6,409 black abalone was seized. To date, five persons have been convicted of violation of Section 8306.5 of the Fish and Game Code. The combined sentences involved $2,020 plus 87 days in jail. Additionally, one fishing vessel valued at $5,000 has been ordered forfeited to the state. The forfeiture is currently under appeal. Department aircraft and patrol vessels played a significant part in effecting the arrest.

During 1973, marine wardens seized 75,385 pounds of yellowfin tuna valued at $18,356.26 for violation of the yellowfin tuna regulations.

BOTTOMFISH PROGRAM

Bottomfish landings in 1973 are estimated to be about the same as the record 1972 catch of 54 million pounds. Bottomfish prices to fishermen increased to the highest levels in the history of the fishery. The California trawl fleet continued to increase; 95 vessels participated in the trawl fishery in 1973. Catches by the fleet came from nearshore areas to deeps of nearly 600 fathoms between southern California and southern Oregon.

Landings at 13 ports between Port Hueneme and Crescent City were closely monitored in 1973. The logbook data we obtained for the entire catch revealed that fishing effort increased in 1973 to 70,000 hours and the catch per hour of 750 pounds remained similar to catch effort of recent years. Fishing effort was distributed among traditional trawling grounds although in 1973 more effort was expended in deeps off central California.

Dover sole remained the leading species in California landings. Rockfish, a multi-species group, was second in landings. Sablefish and lingcod landings continued to increase. English and petrale sole landings were at the same levels of recent years.

Advances in fishery technology were noted in 1973. Filet skinning machines were utilized at Eureka and experiments were conducted with a brine process for preservation of fish at sea.

To keep abreast of the increasing rockfish fishery, a sampling program to determine the species composition was implemented in 1973. The important species in the shallow to intermediate depths are bocaccio, chilipepper, canary, splitnose, darkblotch, and black rockfish. In the deep water fishery shortspine and longspine thornyheads are the predominant species.

Landings of Dover, English, and petrale sole were sampled at major ports to obtain supplemental information for use in diagnoses of condition of the stocks. The stocks of groundfish utilized by California fishermen appear in good condition.

A cruise of the N. B. SCOFIELD was conducted in July to determine the distribution, abundance, migrations, and stock identity of Dover sole in the Punta Gorda area. Fishing operations were carried out in 345-610 fathom depths where we tagged and released 261 Dover sole. We also tagged 48 sablefish as part of an international study on sablefish migration and stock identity.

A gill net study of roundfish in areas where different rates of exploitation occur was continued with the N. B. SCOFIELD off the Monterey and Point Sur areas. This was one of three cruises planned during different oceanic regimes; two cruises have been completed. Analyses of data indicate differences in catch rates, sizes, and species composition among areas.

Tom Jow participated aboard the U.S.S.R. research trawler SESKAR during part of an acoustical and trawl survey of Pacific hake and rockfish from Vancouver Island to Monterey Bay. In the acoustical survey fish were abundant at 80 to 200 meter (43-109 fathom) depths. Young hake (Age I) were abundant in trawls south of Point Arena. Concentrations of splitnose and shortbelly rockfish were noted in the central California area. This is the second year that California has participated in cooperative research with the U.S.S.R.; last year R. J. Nitsos was the U.S. scientist aboard the research trawler OGON.

Coordination of bottomfish research and management activities of the Pacific coast was continued through the Pacific Marine Fisheries Commission and the International Groundfish Committee. California bottomfish data was provided for U.S.S.R.-U.S. and Japan-U.S. Bi-lateral negotiations and for the 1973 International North Pacific Fisheries Commission meeting.

SHELLFISH PROGRAM

Crab

The crab fisheries of the San Francisco and Eureka-Crescent City areas were monitored during 1973 to ascertain catch and fishing trends. Catch sampling at sea aboard commercial vessels was conducted to determine segments of the crab population handled by fishermen. Opening day and early season interviews with fishermen at the central California ports were conducted to determine catch-per-trap and areas fished.

During 1973 a total of 5,000 sublegal crabs were tagged on the north coast for growth and migration studies. Of these 1,500 crabs were tagged in Humboldt Bay, 550 in ocean waters off Mad River, 50 in Trinidad harbor and 2,900 in Crescent City harbor. Most tagged crabs were of the 1972 year class and returns are expected during the 1973-74 commercial crab season.

Forty-four tagged crabs from 1971 and 1972 central California taggings were recovered during 1973. One tagged crab which was at liberty 576 days retained its tag through at least four molts while growing 80 mm and traveling 45 miles from the upper end of San Pablo Bay to 20 miles west of the Golden Gate.

A crab cruise was conducted in September off central California to determine the relative abundance of all size segments of the resource. Legal-sized crabs were few in number but did show an increase over the figures obtained during the 1972 pre-season cruise. The 1973 year class appeared to be much stronger than the 1972 year class and may provide larger landings during the 1975-76 season.

Another crab cruise was conducted in the Eureka-Crescent City area during October. Results indicate a very poor 1973-74 season although the 1972 year class is strong and could enhance the outlook for the season if a portion of this dominant year class molts to legal size. Numbers of juvenile crabs (1973 year class) were much lower than were found during the 1972 crab cruise.

Monthly trawling in Humboldt Bay to determine relative year class abundance showed the 1972 year class to be very strong while juvenile crabs were in low abundance.

Shrimp

The 1973 Area A ocean shrimp catch of 980,000 pounds was the lowest since 1964.

Routine sampling of the Area A shrimp catch was conducted throughout the 1973 season to determine length, weight, sex, and year class composition. Additional samples were fixed at regular intervals, and will be processed for histological examination of gonadal tissues.

Age composition of the catch was different in several respects from that expected for an odd-year season. Three-year-old shrimp (1970 year class) were unusually abundant during April and May, while one-year-old shrimp (1972 year class) made up barely half of the catch during the heavy fishing months of July and August. One-year-old shrimp normally comprise up to 80% of the catch during an odd-year season. The average size of both one and two-year-old shrimp was somewhat larger than in recent years.

Shrimp samples obtained during the fall crab cruise and the results of hake stomach contents analysis indicate that the 1973 year class is as strong as most even year classes have been for the last 10 years. It appears that the trend of year class dominance is in the process of being reversed from even to odd.

The outlook for the 1974 season depends to a large extent on the strength of the 1973 year class as one-year-olds in 1974, since the 1972 year class cannot be expected to contribute heavily to the fishery.

Landings were also sampled in Area B-2 (Bodega Bay) to determine length, weight, sex and year class composition. The 1971 year class contributed about 75% by number to the landings.

Clams

Twenty-five low tides were monitored at Clam Beach for razor clam catch and effort data. Catch per digger averaged 15.5 clams, which was a considerable improvement over last year's average take of 2.6 clams. Most of the clams harvested were two years old; average size of all clams measured was 95 mm.

Whenever possible a monthly sample of clams was fixed for histological examination of gonadal tissues.

In March 1974, razor clam digging will revert back to the alternate year closure system, with the south beach open during even years, and the north beach during odd.

Oysters

Pacific oyster seed produced at the Marine Culture Laboratory from Drakes Estero stock was planted in Drakes Estero and Elkhorn Slough for growth and survival studies. Initial survival appears excellent.

Experimental populations of Pacific oysters set in Dabob Bay and entering their second summer in Humboldt Bay were monitored for mortality. Only 3% of these oysters suffered mortality, a figure comparable to the mortality of the analogous year class during 1972.

"Mortality resistant" seed set at the Marine Culture Laboratory in 1972 were monitored for growth and mortality. Growth of seed planted in the spring of 1972 is superior to those planted during late summer. Mortality among these experimental populations was low, averaging about 4% and mostly due to crab predation.

A total of 9,520 standard cases of Pacific seed oysters from Washington State was inspected for pests. Arrangements were made with the Washington Department of Fisheries to inspect the bulk of the seed. The seed shipments represented the second highest total of seed ever shipped from Washington State or British Columbia. Other species inspected included 100 standard cases of Kumamoto oyster seed from Japan; 130 bushels of adult Eastern oysters from New York State; and 26,000 pounds of Chione clams from Mexico.

ABALONE

A final 430 page Marine Resources Technical Report was completed in June that describes the project's two year environmental study in the Diablo Cove area. The study established a base line inventory of the marine biota with major emphasis on abalones, including their food chain, and bony fishes.

Our Sea Grant team in northern California recovered 200 tagged red abalones that had been at liberty 1 to 2 years at Pt. Cabrillo and tagged 500 in a new study area at Van Damme State Park.

In August we began a two year research program in southern California to develop basic management information on pink and green abalones. The program will include life history, population dynamics and distributional studies as well as an analysis of the historical and present fishery. Between August and November we tagged about 7,000 pink and green abalone at San Clemente, Santa Catalina and Santa Cruz Islands.

Our annual Point Estero red abalone population survey found the red abalone population (estimate) has declined to 14.4% of the 1967 population estimate prior to the arrival of the California sea otter in substantial numbers.

LOBSTER

On August 17, 1973, the Commission, by emergency action, added to its commercial lobster regulations the requirement for a daily log. The 1973-1974 season, beginning in October, was the first time lobster fishermen maintained logs. The cooperation of the fishermen has been excellent.

In October fishermen reported in their logs 60,750 legal lobsters caught at a catch-rate of .5895, a little better than one lobster for two traps pulled; in November, the catch was 28,128 legal lobsters caught at a catch-rate of .4543.

In 1973 two overflights of three days each were made throughout the southern California lobster fishing area. Trap buoys were counted to obtain estimates of effort and to locate areas of greatest fishing intensity. Close to 5,000 traps were counted on each occasion.

Field studies were initiated in August to obtain biological data. Scuba surveys and trapping have been conducted at San Clemente and Catalina Islands, and the Palos Verdes Peninsula. Over 400 lobster were marked with coded tail punches at Catalina during December. Additional lobsters will be marked in 1974. Traps will be set in the Catalina study area each month and recaptured marked lobsters will be measured for growth determination.

Escape port studies were also initiated in 1973.

Cruise Reports

Haugen, Charles. 1973. Cruise Report 73-KB-24. Calif. Dept. Fish and Game, Mar. Res. Reg. 2 p.

_____. 1973. Cruise Report 73-KB-28. Calif. Dept. Fish and Game, Mar. Res. Reg. 1 p.

Hardy, Robert. 1973. Cruise Report 73-KB-30. Calif. Dept. Fish and Game, Mar. Res. Reg. 1 p.

_____. 1973. Cruise Report 73-KB-33. Calif. Dept. Fish and Game, Mar. Res. Reg. 1 p.

MARICULTURE RESEARCH AND DEVELOPMENT
(Bartlett Project 4-20-R)

Principal investigations of the Marine Culture Laboratory focused on the Pacific oyster, spot prawn and the red abalone. Research was also accomplished on the market crab and the Pismo clam.

Progress was made in our study to develop a resistant strain of Pacific oyster. A second generation was spawned, cultured and distributed onto experimental growing plots at Drakes Estero and Elkhorn Slough. It is too early to determine whether our selective oyster strain has an inherent superior resistance to the factor(s) responsible for periodic high mortalities experienced with commercial stocks.

Red abalone studies concentrated on development of spawning techniques, and general culture methods. Difficulties were experienced in locating a supply of reproductively mature stock until mid-July. Mature male red abalones consistently spawned upon being exposed to elevated temperatures. However, females exhibited variable results to this same stimulus, and poor success was achieved through early embryological stages.

A successful spawning was achieved in late November. Survival from the egg to the veliger stage larvae exceeded an estimated 90 percent in a number of cultures. Most mortality occurred when the free-swimming larvae metamorphosed to the benthonic stage. Two types of diatom coated panels, and crustose coralline algae on rocks, were evaluated for "catching" larvae.

A stack culture system looks promising for rearing juvenile red abalones. This method not only increases the number of abalones that may be grown per unit area, but also keeps the forage proximal to the abalones. The abalones are immersed in a shallow lens of continuously flowing seawater.

The year 1973 concluded the third year of investigating the mariculture feasibility of the spot prawn. Mass culture systems and stocking densities were examined. A pilot-production operation was undertaken in cooperation with a private mariculture company. Approximately 1,800 spot prawns were distributed into grow-out tanks along with red abalones. Unfortunately the majority of the spot prawns were lost due to water quality problems.

Preliminary investigation of culture techniques for the Pismo clam were initiated. Adult clams were maintained in a sand bed having a sub-sand water filtration system and supplied with continuously flowing seawater.

Supplemental feeding was provided for conditioning purposes. Clams were induced to spawn at an elevated temperature. Good developmental success was achieved through embryological and larval clam stages.

Culture studies of the market crab yielded only marginal success. A variety of culture systems and techniques were employed. Very few crab larvae survived through the various developmental stages and metamorphosed to the first crab instar.

Our second annual "Open House" was held in May and was well received by the general public. Additionally 22 school groups, and numerous individuals having an interest in mariculture toured the laboratory.

Publications

Ebert, Earl E. 1973. Mariculture in California. Mar. Res. Tech. Rept., (18):1-13.

MARINE RESOURCES PATHOLOGY

A report was prepared on the 1972-1973 investigations concerning the occurrence of neoplastic-like lesions in fish populations in California's coastal and estuarine waters. Low incidences of such lesions were found among populations of white croaker and Dover sole in the Santa Monica Bay area, English sole and rex sole in the area near San Francisco and rex sole in the area from Eureka to the Oregon border. Slightly higher incidences were noted among the English sole from within Humboldt Bay. Samples taken from Monterey Bay showed no fish with neoplastic abnormalities.

Five species of exotic mollusks imported for use in mariculture activities by various California groups were inspected for parasites and examined histologically. Samples of seed oysters and clams spawned and reared by Pacific Mariculture, Inc. were routinely submitted and examined for disease prior to shipment throughout the world.

The survival of two generations of seed oysters spawned from long-lived stock from Humboldt Bay was compared with the survival of commercial stocks in several California bays. Losses were very low for both groups.

Special services to other projects included pathological examination of orangemouth corvina from the Salton Sea, histological study of sea otter tissue, and one year of observation of reparative processes of abalone wounds.

APPENDIX II

SPECIAL STUDIES PROGRAM

The project (formerly the Sea Otter Project) was renamed in August 1973 to reflect changes in emphasis resulting from the federal Marine Mammals Protection Act of 1972. This Act, which took effect on December 21, 1972, placed all marine mammals under federal jurisdiction. We have conducted no sea otter capturing and tagging operations since that date.

In early 1973, field observations indicated that the sea otter's established range had extended to the vicinity of Point Buchon on the south and the vicinity of Santa Cruz on the north. A high count of 137 sea otters was observed in the Point Buchon area in April. Toward the end of the year, the southernmost rafting area was just north of Diablo Cove. At the north end of the range, we observed five sea otters near Santa Cruz early in the year. During the fall, we received reports of up to 14 sea otters at a time foraging in the vicinity of Moss Landing. These otters reportedly were feeding primarily on Pismo clams.

Food habits studies were begun at Point Buchon within two weeks after a group of sea otters was observed there in January. Sea urchins, abalones and rock crabs comprised over 90% of the diet during our observations in this area from January to April.

Tagged sea otters were observed in the vicinity of tagging in the Monterey and Cayucos Point areas during January to April 1973. At least two of the otters tagged from Point Estero to Cayucos Point were subsequently seen near Point Buchon, nearly 15 miles to the south during this same period.

An aerial sea otter census on December 3 and 4 produced a total of 941 sea otters from just north of Santa Cruz to Shell Beach. Population estimates from three different methods indicate that the total sea otter population in California is at least 1,700 animals.

A total of 85 sea otter carcasses was recovered during the year. The largest number recovered in any previous year was 51. A significant increase in sea otter carcass recoveries occurred during the 1972-73 winter-spring period. From January through June 1973, 65 carcasses were recovered, 55 of which occurred from January through April. This is more than 2-1/2 times the highest number recovered in any January-April period. Our observations indicate that this was a natural mortality due to severe winter conditions combined with some crowding and depleted food supplies, primarily toward the extremes of the range. Work on sea otter necropsies is continuing.

Much of the year's time was spent writing a comprehensive report of 5 years of Departmental research on sea otters and related problems. This report was submitted in mid-November for publication as a technical report.

In late October, efforts were directed toward gaining some insight on declining market crab landings in the San Francisco area. Initially,

an attempt will be made to determine if hatching and larval survival of crabs is being affected by pollutants in the San Francisco Bay area. During November and December, gravid female crabs were being collected from both San Francisco and Eureka areas for analysis of levels of polychlorinated hydrocarbons, PCB's and trace and major elements in the eggs. Later in the season, megalops and first instar crab stages from both areas will be subjected to similar tests. These studies are being coordinated with the Shellfish Program and the Department's pesticide and heavy metals laboratories. Concurrently, relative fecundity studies are being conducted on live gravid female crabs by the Marine Culture Laboratory staff. Comparisons will be made on crabs from both areas.

Assistance of approximately 1/4 man month per month was provided toward the end of the year to the accelerated Abalone-Lobster Program in southern California.

Publications

Wild, Paul W., and Jack A. Ames. (In press) A report on the sea otter, *Enhydra lutris* L., in California. Mar. Res. Tech. Rept., (20):1-93.

Wild, Paul W. 1973. Flight report 73-C-3: sea otter. Calif. Dept. Fish and Game, Mar. Res. Reg. 4 p.

PELAGIC FISH PROGRAM

Anchovy

During the 1972-73 anchovy reduction season (August 1, 1972-May 15, 1973), 75,519 tons were landed at California ports. Of this total, 66,545 tons were processed by four San Pedro plants, 8,597 tons by one Port Hueneme-Oxnard plant, and 377 tons by one plant at Moss Landing. Fishermen received $24 per ton at the beginning of the season, but due to a world wide shortage of protein feed additives and particularly because of the severe decline in Peruvian anchovy meal production, the price rose to $47.50 per ton by the end of the season.

During the season, 420 samples (6,037 individual fish) were collected and processed from the San Pedro catch. Analysis of these samples revealed that 48% of the fish caught were in their third year of life. This same 1970 year class dominated 1971-72 landings when they contributed 46% of the catch during their second year of life. The 1972 year class (young of the year) contributed 8% of the catch, the 1971 year class 22%, the 1969 year class 17%, the 1968 year class 4%, while fish in their sixth, seventh, and eighth years of life contributed less than 1%.

The ninth anchovy reduction season opened on August 1, 1973. As a result of the continuing world wide shortage of protein additives, an all time high opening price of $57.50 was paid to the fishermen. Fish were abundant and readily available so several boats started fishing in the northern zone on opening day. A few southern California purse seiners

landed considerable tonnage at southern California ports, these fish were reported as being caught just north of Point Conception and were credited to the northern permit area quota. By October 1, 1973, southern California boats had delivered 7,007 tons from the northern permit area and Monterey-Moss Landing boats 2,087 tons. Because this total was close to the northern quota of 10,000 tons the Fish and Game Commission, at the request of the Monterey Bay fishermen and processors, increased the northern quota by 5,000 tons. In addition, the Commission moved the boundary between the northern and southern permit areas to Point Buchon which is approximately 50 miles north of Point Conception. At year's end, a total of 10,602 tons had been taken from the northern permit area and 78,756 tons from the southern permit area. Due to a recurring water quality problem at Fish Harbor, San Pedro canners cancelled all orders for anchovies from October 5 to October 21. Fishing resumed at a lower level and boats were placed on rather low limits. Because of a moderate decline in world fish meal prices the price paid to California fishermen fell to $47.50 per ton in late October but then rose again to $57.50 per ton in December.

Live Bait

The 1973 live bait season was a difficult one for many of the fishermen from January until late September. Bait fishermen began having problems

when, from December 1972 until May 1973, anchovies were extremely scarce in the Oxnard-Ventura area. Fishermen stated that this was the longest period of time in their experience that bait was unavailable. However, spawning squid appeared in good numbers and bait haulers used them to alleviate some of the pressures brought about by the lack of anchovies. South of Santa Monica Bay fishermen encountered the customary shortages which occur during winter and early spring. Anchovies were available for the most part between Los Angeles and San Diego but often the fish were wild and difficult to catch. In Los Angeles Harbor, anchovies did not consistently school-up under the light skiffs and bait fishermen were forced to fish outside the harbor and as far south as Newport Beach on many occasions. Fishing improved somewhat in May, but on many nights a great deal of running time and effort were required of bait haulers to meet their commitments.

Beginning in June and continuing to late September a large influx of "pinhead" anchovies occurred both inside Los Angeles Harbor and inshore along most of the southern California coast. These presented a major problem to sportfishermen since "pinheads" are not satisfactory as hook bait and can only be used for chumming. Santa Monica Bay was an exception for most of the summer with larger fish making up a major portion of the bait catches in that area. San Diego fishermen did not make any trips to San Pedro during the summer, but did spend many nights 10 to 15 miles offshore in order to obtain bait. Newport Beach bait haulers fished in Los Angeles Harbor on many occasions and as far south as Oceanside during the latter part of the summer.

In September fishing improved in all areas when large anchovies again moved inshore along the entire southern California coast. The abundance of bait coupled with low demand relieved much of the pressure on the bait haulers, and enabled them to meet their commitments with little difficulty for the remainder of the year.

Mackerel

The recorded commercial catch of Pacific mackerel was less than 50 tons for 1973. The moratorium continued to be effective. The incidental occurrence of Pacific mackerel in loads of jack mackerel was small and probably did not exceed 1%.

Southern California commercial passenger fishing vessels reported a sports catch of 189,000 Pacific mackerel through September compared to 227,000 fish for the same period in 1972.

Jack mackerel landings have been far below normal with only 8,850 tons being recorded this year. In 1972 over 25,000 tons were landed, and the average annual catch for the past 10 years has been about 32,000 tons. One factor for the lower catches has been the increased fishing effort for anchovies, but jack mackerel also were uncommonly low in availability during the year. The same fleet fishes both species.

Sardines

The 1972-73 sardine bait catch, limited by law to 250 tons, was only

89 tons. In 1973 the legislature passed and the Governor signed sardine management legislation which will impose a moratorium on sardine fishing, effective January 1, 1974. This moratorium will remain in effect until the spawning population of sardines reaches 20,000 tons. At that time a commercial fishery will be initiated.

Squid

Squid landings were disappointing because of the failure of squid to appear in quantity on the historical Monterey fishing grounds. By the end of 1973 less than 5,000 tons had been landed statewide compared to 10,000 tons in 1972. During the year plans were formulated for a more intensive research effort on the statewide squid resource.

Pacific Herring

Because of a lucrative oriental market for herring roe products, a renewed interest in the California resource developed in 1972-73. A limited fishery under close Departmental scrutiny and regulation resulted in a catch, during January and February of 1973, of 599 tons in Tomales Bay and 403 tons in San Francisco Bay. These catches were in addition to the minor amounts that were taken for bait in Tomales, San Francisco, and Monterey Bays during other months of the year. Legislation was passed in 1973 directing the Department to conduct a 2 year study as a basis for managing central California herring stocks. As a result, we planned and implemented comprehensive survey programs in Tomales and San Francisco Bays.

Sea Survey

Nine sea survey cruises were conducted during 1973. The anchovy resources of northern Baja California and southern California were acoustically surveyed on four cruises, and those of central California during one cruise. Nearly 5,600 nautical miles of echo ranging and sounding were

completed. Two cruises were devoted to developing methods of estimating anchovy school biomass from acoustic records. An exploratory survey for market squid was made in central California, and a survey was made using night-light and blanket net to monitor Pacific mackerel and Pacific sardine populations in southern California waters.

The increase in the anchovy population off northern Baja California and southern California, as indicated by acoustic surveys in 1972, has continued through 1973. Surveys this year indicate a larger population than at any time since acoustic surveys were initiated in 1966. Very conservative estimates of biomass for this region range from 1.7 to 2.5 million tons. Highly successful recruitment from this year's spawning should result in a continued increase.

A great abundance of fish and occurrence of widespread favorable schooling behaviors during the spring and fall of 1973 have provided the best fishing conditions the anchovy fishery has ever experienced. A much greater catch could have been attained except for shore plant capacity limitations and water quality problems. Availability and catchability differed considerably from past years. During the first 3 months of 1973 over

two-thirds of the anchovy population was located off northern Baja California. This is the first time we have detected such a large portion of the population in Mexican waters. At that time schools were comprised of loose layers of fish insufficiently concentrated for effective commercial harvest. By the end of March 1973, these anchovies had migrated back into southern California waters where they concentrated into numerous dense compact highly catchable schools. Surveys in the fall found anchovies much more widely distributed than previous fall surveys. Although most of the population was located in southern California waters, there were unusual amounts off northern Baja California. Schooling behavior was highly unusual with dense daytime surface schools, usually found only during spring, prevailing over much of the area. This behavior plus good night school concentrations presented favorable conditions for purse seining.

Progress was made toward more accurate assessment of anchovy school biomass which is the key to more accurate estimations of population size. Target strength, volume back scattering strength measurements, and simultaneous underwater visual observations have added to our knowledge of acoustically assessing school sizes and densities.

Data Analysis

In 1973, several different methods of determining Pacific mackerel population size were investigated as mechanisms for estimating the spawning population size of Pacific mackerel stocks north of Punta Eugenia, Baja California. The estimate of Pacific mackerel spawning population size obtained by a tagging procedure was 5,480 tons. Three additional methods were used to estimate spawning biomass. These estimates were 4,730 tons, 6,210 tons, and 6,970 tons. All of these estimates were less than the 10,000 tons required to initiate a commercial fishery under the Pacific mackerel management regulation (Sec. 8388.5).

Analysis of Pacific mackerel maturation and growth data reveals spawning can occur from March through October, but the majority takes place from April through August. During this April through August period, 22.5%, 65.5%, 75.1%, 84.7%, 84.2%, and 87.5% of the female fish were mature or maturing for Age Groups I, II, III, IV, V, and VI+ respectively.

Examination of past Pacific mackerel data and estimated parameters has raised serious doubts about the reliability of historical estimates.

Analysis of 18 years of the jack mackerel cannery fishery has shown an almost 10 to 1 variability in year class strengths occurring in the past.

Intensive investigations of sardine data for population estimates were initiated with the passage of the Sardine Management Bill (SB 192).

Mackerel Tagging Program

The Mackerel Tagging Program was initiated in August 1971 under contract with the Marine Research Committee. By the end of 1972, program personnel had tagged 11,215 jack mackerel and 1,898 Pacific mackerel. During 1973, a total of 4,640 jack mackerel and 1,509 Pacific mackerel was tagged. These fish were tagged and released from Departmental research vessels

and cooperating commercial fishing vessels in the San Pedro purse seine fleet. Additional fish have been supplied by local southern California live bait operators.

Tagged fish have been recovered at a rate of 1% for jack mackerel and 3 3/4 % for Pacific mackerel. Jack mackerel recoveries primarily come from cannery personnel while tagged Pacific mackerel are most frequently returned by sportsmen. Tag return data from the jack mackerel are being utilized to chart the inshore movements of the population off southern California and to supplement electrophoretic, morphometric, and meristic data concerning the racial characteristics of this stock.

Tag and recovery data from the Pacific mackerel are used in estimating the spawning biomass of this species between Pt. Eugenia, Baja California, and Pt. Conception. This information is reported annually to the State Legislature.

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BIG GAME FISH

Albacore:

The first albacore were landed during mid May. They were caught between 1,000 and 2,000 miles offshore, from vessels chartered by the American Fishermen's Research Foundation to locate albacore schools prior to the beginning of the regular coastal fishery.

The coastal fishery was about a month late this year; it began late in July and ended during mid November. Most of the fish off California were caught in the Morro Bay area and northward. Ocean temperatures on the traditional fishing grounds located off southern California and northern Baja California also were satisfactory for albacore, and there may have been a lot of fish there, but very few fishermen worked this area. Most operated north of Point Conception, California in the general locations where the National Marine Fisheries Service had predicted the fish would be most abundant.

Preliminary figures show that sportfishermen aboard party boats caught about 8,100 albacore--the smallest harvest since 1959. Preliminary figures also show that commercial fishermen produced about 7 million pounds of albacore. This is considerably below the 21 million pounds landed last year (1972) and the 25-year average of 33 million.

The albacore migration, much of which appeared to have bypassed southern California as indicated by records of the fishermen, consisted of seven age groups (age 0-VI). Also, there was a larger percentage of age-III fish in the migration this season than last; the average weight was about 19 pounds while last year it was only 16.

Age group	1972 Percent age composition	1973 Percent age composition
0	1	1
I	10	3
II	70	31
III	17	45
IV-VI	2	20

The sharp drop in the annual sport and commercial harvest and the marked change in location and composition of the albacore migration mean that we should keep a closer watch on this resource and its fishery.

Bluefin tuna:

The 1973 migration arrived in early June, about 1 month later than usual, and was not fully underway until July. Bluefin left our waters in early September (about a month early) after commercial fishermen had harvested approximately 8500 tons. Age-I bluefin contributed the largest percentage to the migration this year while age-II fish predominated in 1972, and age I fish predominated in 1971.

Age group	1971 Percent age composition	1972 Percent age composition	1973 Percent age composition
I	60	44	66
II	39	50	33
III	1	6	1

Partyboat fishermen caught 5,343 bluefin tuna this year, about 3½ times the sport take in 1972 and the second highest on record, which was 34,187 in 1956.

Bonito:

Preliminary figures for 1973 reveal that commercial bonito landings increased again this year. A total of 11,390 tons was landed in California, with 44 percent of the catch reported from waters off Mexico. During 1972, only 29 percent of the total landings (10,000 tons) was from Mexico. The majority of the catch in 1972 consisted of fish in age groups III & IV, while 72 percent of the fishery in 1973 was made up of I- and II-year-old bonito. Throughout the season the number of bonito in the sportcatch surpassed last year's figures. Preliminary data reveal the 1973 sportcatch to be 471,110 fish, an increase of 52,126 over last year. One-year-old bonito were the dominant age group.

	Commercial Catch			Sport Catch	
Age	1972	1973	Age	1972	1973
0	12%	-	0	-	8%
I	15	47%	I	78%	83
II	9	25	II	21	6
III	21	10	III+	1	3
IV	30	11			
V	12	6			
VI	1	1			

Techniques for age determination of bonito were thoroughly explored this year. Otoliths appear to be a reliable tool and have been used to assign ages for all fish sampled from 1969 to the present. Data collected for a paper on the age and growth of Pacific bonito are in the final stage of analysis.

Research on the population structure continued throughout 1973, with the collection of material for electrophoresis nearing completion.

A total of 1,086 bonito was tagged and released during 1973 from sport boats and Department research vessels. These fish were tagged between Point Conception, California and Cape San Lazaro, Baja California. More than 295 tags have been recovered this year. Since the project was initiated, more than 13,000 bonito have been tagged; the overall recovery rate is eight percent. Seasonal trends in migration were observed from these recoveries, and valuable information on growth rates was obtained.

Billfishes:

More than 70 commercial boats landed an estimated total of 1 million pounds of swordfish in 1973. An average price of $1.25 per pound coupled

with many boats from the albacore fleet entering the fishery accounted for a higher poundage in 1973 than in 1972.

Sportsmen reported a total of 14 swordfish. This is well below the 36 caught by sportsmen in 1972. A controversy concerning the use of airplanes to spot swordfish for harpooning sparked numerous rumors about the health of the resource and resulted in the introduction of legislation aimed at limiting the fishery.

During the 1973 season, 226 swordfish representing 52,000 pounds were measured and weighed. Carcass lengths ranged from 110 cm to 222 cm, while the weights ranged from 81-521 lbs (headed and gutted); preliminary analysis shows that these represent about 5 size groups.

Male swordfish, which many fishermen believed did not enter the fishery, were taken during the last month of the season.

Barracuda:

Partyboat landings of barracuda exceeded 91,000 fish in 1973 compared to 38,000 in 1972. Sampling aboard partyboats indicates that more large fish (28 inches and larger) were available this year than in 1972. The average size of fish sampled in 1973 was 63 cm. About 89 percent of the barracuda caught aboard partyboats were smaller than the legal size limit and had to be released.

Partyboat angling was most successful between Dana Point and Point Loma with concentrations observed along inshore areas near the Encina Power Plant and La Jolla.

Preliminary figures for 1973 indicate that commercial barracuda landings reached about 33,000 pounds. This is a significant improvement over a record low of 13,915 pounds for 1972.

A total of 1,484 barracuda was tagged and released off southern California from partyboats and Department research vessels. Forty-two have been recovered to date. Information from the tag recoveries indicates that during the fishing season there is a great deal of random movement by barracuda within the area off southern California. An exception to this is illustrated by 10 of 11 tags that were recovered from a group of barracuda released at the Encina Power Plant. These fish appeared to move northward throughout the season. Barracuda tagged in 1973 have been recovered as far away as 84 miles in 229 days.

Population estimates indicate that there were 226,000 barracuda off southern California in 1972 compared to 679,000 in 1973. Most of the young fish (age IV and younger) harvested are caught by sportfishermen, while the commercial fishermen catch older fish:

Age group	Sport Catch Percent age composition	Commercial Catch Percent age composition
I	1	-
II	20	-
III	28	1
IV	37	21
V	10	40
VI	3	20
VII+	1	18

White Seabass:

Preliminary information indicates that the 1973 sportcatch (7,058 fish) was 80 percent greater than last year. Much of this is probably due to a change in the law. This change allows anglers to keep one undersized fish. Data collected aboard partyboats and in the fresh fish markets show that there are large differences in the age groups of white seabass harvested by commercial and sport fishermen:

Age group	Sport Catch Percent age composition	Commercial Catch Percent age composition
I-VIII	79	31
IX	7	13
X	7	22
XI	7	16
XII	5	-
XIII+	13	-

Yellowtail:

Preliminary information indicates that the 1973 sportcatch (217,954 fish) was 250 percent better than last season. This may have been due to an increase in availability caused by warm sea temperatures early in the year. Although there were differences in percentage distribution of the individual age classes, ages II-VI provided the bulk of the harvest again in 1973:

Age group	1972 Percent age composition	1973 Percent age composition
0-I	3	8
II	12	18
III	11	22
IV	16	13
V	32	22
VI	17	12
VII-XII+	9	5

Miscellaneous:

A plan designed to collect needed catch data from private fishing boats, using a combination of ground and air observers and fisherman questionaires, was tested early in the year. The results indicated that such information could be obtained but only with a significant increase in manpower. No further testing was done due to a lack of manpower.

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Three papers were presented at the 24th Pacific Tuna Conference and one at the Pacific Marine Fisheries Commission Meeting.

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OCEAN SPORTFISH IMPROVEMENT PROJECT

Arrangements have been made to plant twenty thousand (20,000) striped bass into selected southern California coastal streams and estuaries this winter. Two hundred juvenile silver salmon are slated for a test plant into the Santa Margarita River, Orange County, in January.

A panel of university, Federal and State marine scientists has been organized to review all requests for the introduction of non-native marine species. A proposal to introduce the red fish from the Gulf of Mexico was turned down by the panel.

An ocean fishing map of Orange and San Diego Counties is scheduled for distribution in February. Two public information booklets are being developed. One on the care and preparation of sport caught fishes for cooking, the other a compilation of length, weight, and age tables for commonly caught ocean sportfish.

A massive creel census is well underway, mapping fishing success by species and method in the southern coastal counties. More than 5,500 anglers were checked in a five month period.

PARTYBOAT

The preliminary annual partyboat angler catch through December of 1973, shows 5,869,432 fish were captured by 873,428 anglers. This is the largest catch ever recorded and topped the former record year of 1968 by more than 138 thousand fish. Rockfish contributed greatly to this figure by capping last year's record catch by more than 472 thousand fish. The capture of 217,954 yellowtail was the highest in 13 years and fourth highest recorded. A take of 471 thousand bonito was 52 thousand greater than last year. The California halibut landings of 9,572 fish was up 18% from last year's lowest on record catch. It is believed that the increased landings may reflect a population increase that is the result of recently imposed minimum size limit of 22 inches.

The kelp-sand bass catch of 840,000 was down 180,000 fish from last year, Pacific mackerel (199,000 fish) down 47,000; salmon (124,500 fish) down 27,000; striped bass (20,000 fish) down 11,800 fish; albacore (8,100 fish) down 79,000 and sturgeon (634 fish) was down 342.

Anglers averaged a catch of 6.72 fish in 1973 compared to 6.89 fish last year.

Legislation, AB 1786, designed to help restore the California halibut fishery appears to be doing its job well. During the year routine samplings aboard halibut trawlers, show that almost all halibut less than 22 inches long are escaping through the 7½ inch mesh trawl cod end. An amendment to the bill to define trawl cod end size was submitted for legislative consideration. It was observed during sampling that several trawlers were using a 7½ inch cod end of six feet in length instead of one 20 feet long. This short cod end negates the intent and effectiveness of the halibut law, for it tends to stop up with trash and fish, preventing adequate escapement for undersized halibut.

CENTRAL CALIFORNIA MARINE SPORTFISH SURVEY (DJ F25R4)

Fish Bulletin 158 was submitted to the printer in November 1973, and the results of the 1972 skindiving survey from Pismo Beach to Oregon were submitted as a Marine Resources Technical Report. Much of this year's time was spent in preparation of these two publications.

Life history studies were continued on the kelp greenling and rock greenling with the aging and meristic studies nearing completion.

Work was initiated on the kelp bed-juvenile fish study. Equipment was ordered and arrangements have been made for boat moorage.

ENVIRONMENTAL SERVICES

There were 347 project related documents reviewed during the year. Major effort was devoted to review and comment upon regulatory agencies' activities for several power plants, most notably for San Onofre Units 2 and 3, and Encina Power Plant Unit #5. The San Onofre Unit approvals were still before the Coastal Zone Commission at the end of the year. Other reviews were concerned with Diablo Canyon and the Huntington Beach Generating Station.

Liaison with State and Regional Water Quality Control Boards was a high priority effort and included the preparation of reviews and recommendations for Areas of Special Biological Significance, Basin Planning efforts for the entire coast, an ongoing analysis of the proposed Water Quality Control Plan for Bays and Estuaries and for 54 routine waste discharge requirements. Significant activities were also concerned with outfall location studies for the cities of Santa Barbara, Oxnard, and San Francisco and San Diego Gas and Electric Company's Encina Unit #5 discharge proposal.

Pollution incidents that occurred during the year included Venice Canal fish kills, a caustic soda spill in Cerritos Channel, Fish Harbor violations of waste discharge requirements, a raw sewage discharge into L.A. Harbor and a raw sewage discharge into Arcata Bay. Although none of these events were known to cause major fish or wildlife losses, several did cause disruption of resource use by public and commercial activities for extended periods.

Army Corps of Engineer activities involved our review and analysis of some 188 permit applications for modification of the marine environment. Significant input was concerned with illegal fills in Humboldt and Morro Bays and in the Tijuana Slough estuary. In addition, efforts to secure project sponsor responsibility for project site water quality conditions were successfully achieved in the Huntington Harbor area.

Major interaction was also directed to the Corps' San Diego Bay Maintenance Dredging proposal in relation to the selection of mutually agreeable spoil deposition sites and review of their Deepwater Port Study.

Formation of the Coastal Zone Conservation Commissions resulted in additional involvement for the Department including assistance to the various regional commissions in developing a marine element of the Coastal Plan. A monitoring program established by the Commission for Southern California Edison Company's Long Beach Combined Cycle Power Plant requires DF&G participation.

Plans for the development of a Marine Bioassay Laboratory facility at the Granite Canyon site were implemented in December by the awarding of a construction contract for $35,945.

Other activities included involvement in the preparation of a Fish and Wildlife Management Plan for the U.S. Navy's use at San Clemente Island, collection of background water quality data for the new Bolsa Chica Ecological Reserve, and review input to Wetland reports for Humboldt Bay and Los Penasquitos Lagoon.

INSHORE FISHERIES HABITAT EVALUATION AND MONITORING

Environmental surveys of six waste water discharges into the marine environment from Monterey Bay to the Santa Ana River were completed and submitted to the State Water Resources Control Board. This completed the contract studies being conducted for the SWRCB.

The newly created Farnsworth Bank Ecological Reserve was surveyed and mapped from the R/V KELP BASS. A bathymetric chart of the bank was prepared and an uncharted 11 fathom pinnacle was discovered approximately 830 feet west of the shallowest (8 fm) pinnacle.

The project also conducted an evaluation of the marine environment at Newport Beach Marine Life Reserve, and an inspection of an offshore oil and gas seep in 225 feet of water near Santa Barbara.

Assistance was given to various State and local agencies in marine environmental matters.

Over half of the project's effort has been directed towards the new lobster project and the expanded abalone project starting in July, 1973.

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ENVIRONMENTAL AND BEHAVIORAL STUDIES OF COASTAL SPORTFISHES DJ F22R

Man-Made Reefs

The highlight of this year's work was the start of a cooperative effort to restore the Ventura man-made reef, using old tires as reef material. After securing permits, we used the P/B YELLOWTAIL to place reef marker buoys on July 17. The following week we used the "DOLPHIN" to place 16 tire modules on the sea floor. Each module was a cake made from six tires. Each module was weighted with concrete.

All materials and labor were donated by local citizens and businesses interested in restoring the reef. The original quarry rock reef is reported to have been buried under silt carried seaward during the 1969 flooding of the Santa Clara River.

It took less than a month from the placement of the first modules for a school of brown rockfish, *Sebastes auriculatus*, to take up residence on the reef. We estimated there were 150 rock fish up to 15 inches in length, orienting to the tires by the end of August. We also observed some embiotocid perch, and caught some white croaker.

We further assisted reef construction on November 17 when we used the "DOLPHIN" to place half of an additional 36 tire units at the reef site. Local volunteers provided a tug boat to transport and offload the remainder of the units.

In the same general area we worked much of the year with the Ventura County Fish and Game Commission and the State Lands Division to select a site for a reef to be constructed from the wreckage of the LA JENNELLE. This ship washed ashore in April 1970 and has since become a public nusiance. The State Legislature appropriated funds for its partial removal and conversion to a fishing pier and offshore man-made reef. We surveyed and recommended a site several miles west of Channel Islands Harbor. Work on this project was scheduled to begin in early 1974.

We spent several man-days preparing a surplus U.S. Navy barge for sinking at the Redondo Canyon man-made reef to enlarge it. This project was held up by the Corps of Engineers to provide time for public review and by the lack of a Navy tug boat to move the barge to the reef site.

We surveyed many of the existing man-made reefs located in central and southern California, including Santa Cruz Pier, Port Hueneme pier, Hermosa Beach, Redondo Beach, San Pedro Pier reef, Huntington and Imperial Beach.

CONES Study

The study stations were occupied for the final time early in 1973 and report preparation is underway.

Fish Behavior and Life Histories

Studies of sheephead and sculpin continued with samples being collected and fishes being tagged. We tagged 35 sculpin and 8 sheephead. No tagged fish were returned.

Miscellaneous, Meetings, Public Information and Personnel

We made some studies of the Zuma Beach Pismo clam bed as a follow-up to work done a decade ago. We attended meetings and provided information on project and Department work with the following: Ventura County Fish and Game Commission, Ventura County Fair, State Lands Division, Los Angeles County Advanced Diver Program, Burbank High, California State College at Long Beach, Ventura Cable TV, State-Federal Fisheries Workshop, Greater Los Angeles Council of Divers National Spearfishing Championships, Long Beach Exchange Club, KCOP-TV's Dialing for Dollars, C^2MESS committee meetings and numerous private individuals.

Richard Moe resigned in September to accept a position as Station Scientific Leader at Palmer Station, Antarctica, under a NSF Grant. Richard Dixon was appointed in December.

We participated in meetings of the Dive Safety Board and diver certification and re-certification courses.

SPORTFISH-KELP PROJECT DJ F27D

During 1973, project efforts were primarily directed toward transplanting giant kelp, *Macrocystis* to Palos Verdes Peninsula. Over 1800 plants, representing a biomass of over 54,000 pounds, were transplanted aboard the R/V KELP BASS from healthy kelp beds on Catalina Island to our Abalone Cove study site during 1973.

Plants were installed by project divers on chains, placed in Abalone Cove by researchers from Cal Tech who are cooperating with the Department in kelp restoration efforts at Palos Verdes.

The large losses of plants incurred in 1972, because of heavy seas and excessive damage resulting from kelp foraging fishes, have not occurred this year. Furthermore, conditions for *Macrocystis* growth have been good throughout the year and we estimate that the original biomass of the transplants has tripled. We now feel that the biomass of transplanted kelp is sufficient to protect fragile juvenile plants from excessive grazing damage. An estimated 200 young *Macrocystis* plants, arising from adult plants transplanted since January 1973, have settled naturally within the Abalone Cove study area and appear to be growing well. More recruitment is expected in spring 1974.

Several chains, to which kelp has been attached, were moved into adjacent rocky areas to enhance settling of spores.

The Kelp Project's new research vessel, a 23-foot inboard with tunnel drive, was delivered in September. This boat, named the HALFMOON after a common kelp bed fish, was outfitted as a diving vessel and is performing well.

Life history studies on opaleye, *Girella nigricans* and halfmoon, *Medialuna californiensis* are continuing. We have incurred some difficulties in obtaining sufficient numbers of specimens from all size classes, making aging studies difficult. New techniques to facilitate collection of the needed specimens are under investigation.

DIABLO CANYON ECOLOGICAL SURVEY (P.G.&E. Contract S1902)

The Mendocino phase of this project originated in September 1971 as a two and one-half year contract between the Department of Fish and Game and Pacific Gas and Electric Company to conduct a preoperational ecological study at the proposed site of a nuclear power plant, to establish a baseline inventory of the marine biota with special reference to fishes, abalone and kelp. Since Pacific Gas and Electric Company withdrew its application to the Atomic Energy Commission for a license to operate the plant early in 1973, the Mendocino contract was terminated on June 31, 1973.

Studies carried out at the Mendocino site included: intertidal quantitative transects, subtidal quantitative arcs, compilation of species lists for algae, invertebrates and fish for the area, and abalone and sport fish censuses. A total of 67 random intertidal stations and 71 random subtidal stations were completed during the period of study. Our subtidal stations yielded red abalone and red urchin densities of 5 and 54 animals per 30 m^2 arc respectively. We believe that our study represents the greatest quantitative ecological effort in the marine environment to date performed by the Department in any one area.

During 1972, a total of 1,936 abalone fishermen was interviewed and they caught a total of 8,346 abalone (an average of 4.3 abalone/angler). In the early part of 1973 another 386 abalone fishermen were interviewed and they had a combined catch of 1,739 abalone (4.5 abalone/angler).

Skiff sampling at the port of Point Arena indicates that 5 fish species dominate the sport fish catch; black, vermillion and copper rockfishes, lingcod and cabezon. Fourteen other species have also been recorded from this fishery.

Over 30 fish species have been documented from our intertidal fish collections and we have observed in excess of 20 species during the diving surveys.

Food habit studies were completed on selected fish species to better understand the community dynamics of the study area. A total of 146 stomachs from 14 species of fish have been analyzed and the data indicate that octopus and crab serve as staple ingredients in the diets of several species.

The final report for our Mendocino Studies will be submitted to the MRR editor in January 1974.

In July we began an interim ecological monitoring study at the Pacific Gas and Electric Company's Diablo Canyon Power Plant site. This plant is scheduled to begin operation in late 1974 or early 1975. Our project will also conduct postoperational studies after the plant has been in operation for about a year. The design of our interim studies is much the same as that for the Mendocino site with slight differences. We will continue to monitor permanent stations established during the preoperational studies and monitor a growing commercial abalone effort, and the sea otter population whose range has only recently spread to this section of the coast. In order to distinguish these factors' effects, from any effects the operating nuclear plant may have on abalone populations, we have begun sampling commercial abalone fishermen in Morro Bay and have established a frequent "otter watch" to follow these animals' movements and observe their dietary habits.

To date we have completed 8 permanent subtidal stations and 12 random intertidal stations.

Manuscripts and Publications

Dewees, Christopher M. and Daniel W. Gotshall. 1974. Study of an experimental artificial reef in Humboldt Bay, California. Calif. Fish and Game, (in press).

Gotshall, Daniel W. Robert N. Lea, Laurence L. Laurent, and Therese L. Hoban. 1973. Mendocino Power Plant Site Ecological Study Annual Report - July 1, 1971 to December 31, 1972. Pacific Gas and Electric Company Cooperative Research Agreement S-1902, MRR Administrative Report 73-4.

Gotshall, Daniel W., Laurence L. Laurent and Earl E. Ebert. 1973. Diablo Canyon Power Plant Site Ecological Study, Quarterly Report No. 1. Pacific Gas and Electric Company Cooperative Research Agreement 6S-1047, MRR Administrative Report 73-9.

Gotshall, Daniel W., Robert N. Lea, Laurence L. Laurent, Therese L. Hoban and Gary D. Farrens. 1974. Mendocino Power Plant Site Ecological Study Final Report. Pacific Gas and Electric Company Cooperative Research Agreement S-1902, MRR Administrative Report (in press).

Gotshall, Daniel W., Robert N. Lea and Laurence L. Laurent. 1973. Proposed nuclear plant site is given ecological study. Oceanic Abstracts, 10(5):5-7.

Lea, Robert N. 1973. First record of the smooth alligatorfish, *Anoplagonus inermis* (Family Agonidae), from California waters. Calif. Fish and Game, 59(2):142-144.

MARINE FISHERIES STATISTICS

The regular responsibilities of collecting and compiling sport and commercial fisheries statistics, culminated in the publication and distribution of the following documents: monthly marine sport catch letters, monthly cumulative commercial fish landings by area letter, monthly processors letter, Annual Statistical Circular, and Annual Marine Fish Catch Bulletin.

The Marine Atlas documenting California's living marine resources, consisting of 128 maps, was completed.

Publications:

Oliphant, M. S. 1973. California marine fish landings for 1971. Calif. Dept. Fish and Game, Fish Bull., (159):1-49.

APPENDIX III

MARINE RESOURCES TECHNICAL REPORTS

Rept. No.	Title	Author
1	The use of Otoliths to Separate Groups of Northern Anchovies	Jerome D. Spratt
2	Pacific Hake Length Frequencies at California Ports, 1963-70	Tom Jow
3	Pacific mackerel maturation and growth	Eric E. Knaggs, Richard E. Parrish
4	Mortality Rate of Engraulis Mordax	Alec D. MacCall
5	Status of Northern Anchovy	David Ganssle
6	Status of California Barracuda	Donald L. Schultze
7	Status of Pacific Bonito	Brian D. Thayer
8	Market Crab	Walter Dahlstrom
9	Pacific Hake	Tom Jow
10	Spiny Lobster	John Duffy
11	Jack Mackerel	Eric Knaggs
12	Pacific Mackerel	Alec D. MacCall
13	Pacific Sardine	Charles Haugen
14	Ocean Shrimp	Walter Dahlstrom
15	White Seabass	Parke Young
16	California Yellowtail	Robson Collins
17	Rockfish	Dan Miller and Jim Hardwick
18	Status of Mariculture in California	Earl Ebert
19	Diablo Cove Ecological Study	Richard Burge and Steve Schultz

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Rept. No.	Title	Author	Date
73-1	A Survey of the Marine Environment Near the City of Goleta Ocean Outfall	Dan B. Odenweller	Jan 73
73-2	Ocean Shrimp Report 1972 Season. Sixteenth Annual Shrimp Report	Nancy E. Nelson & Walter Dahlstom	Feb 73
73-3	A Survey of the Marine Environment the Wedron Silica Discharge off Asilomar, Monterey County	Melvyn W. Odemar	Apr 73
73-4	Mendocino Power Plant Site Ecological Study - Annual Report	Daniel W. Gotshall Robert N. Lea Laurence L. Laurent Therese L. Hoban	May 73
73-5	A Survey of the Marine Environment Near the City of Monterey Ocean Outfall	Robert A. Hardy	June 73
73-6	A Survey of the Marine Environment Near the City of Seaside Ocean Outfall	Melvyn W. Odemar	Aug 73
73-7	Status of Pacific Mackerel Spawning Population, 1973	Herbert Frey and Eric Knaggs	July 73
73-8	A Status Report on the Jack Mackerel Tagging Program	Robert Tasto	Aug 73
73-9	Diablo Canyon Power Plant Site Ecological Study-Quarterly Report No. 1	Daniel W. Gotshall Laurence L. Laurent Earl E. Ebert	Nov 73
73-10	The Benthic Environment off Orange County Sanitation District's Ocean Outfall No. 2	Robert A. Hardy	Nov 73
73-11	A Survey of the Marine Environment near Two Brine Discharges at Huntington Beach	Staff IFHEM	Nov 73